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Exploring The Use Of SAR Remote Sensing To Detect Microplastics Pollution In The Oceans

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Exploring use of SAR to detect microplastics pollution in the world's oceans

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Introduction:

About 250 million tonnes of plastic is in the world's oceans:

- ❖ North Pacific (Garbage Patch) - 1.16 trillion plastic items;
- ❖ North Atlantic (Garbage Patch) - 0.53 trillion plastic items.

The risks associated with microplastics pollution:

- ❖ Ingestion by marine animals and fish, transfer via food chain;
- ❖ Leaching of chemical ingredients into surrounding seawater;
- ❖ Release of sorbed pollutants, depending on bioavailability.

The main objective and hypothesis of the research:

- ❖ Objective is to detect areas with microplastics pollution (surfactants and sea-sliks) using SAR images.
- ❖ Microbes colonizing plastic will produce surfactants and sea-sliks.

The goals:

- ❖ To perform contextual analysis of SAR images;
- ❖ To analyse surfactants and sea-sliks on SAR images;
- ❖ To analyse microbiology of surfactants and sea-sliks (in lab).

CONCEPT: MICROPLASTICS DETECTION USING SAR

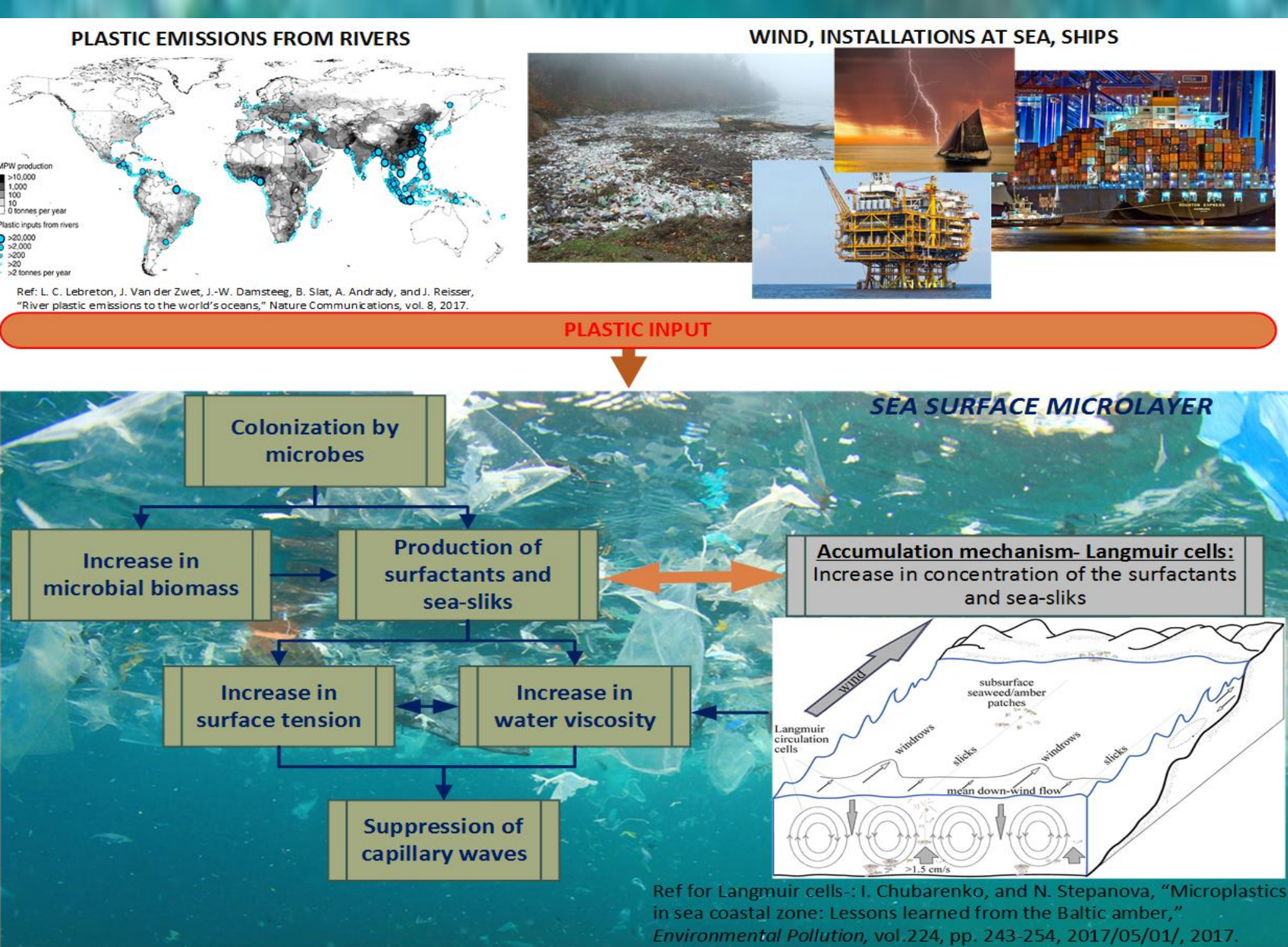


Figure-1 Processes associated with plastic input

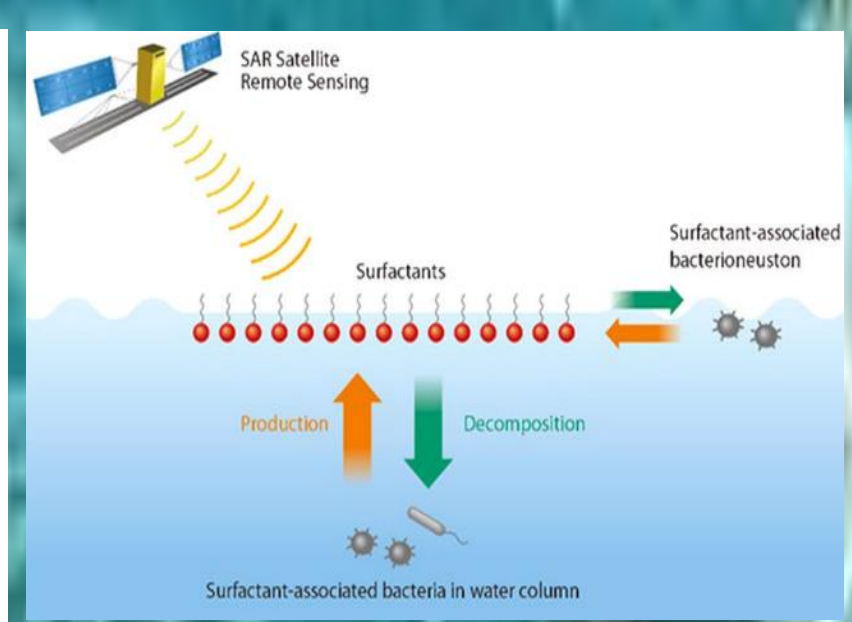


Figure-2 Link between surfactant-associated bacteria, sea sliks and SAR Remote sensing

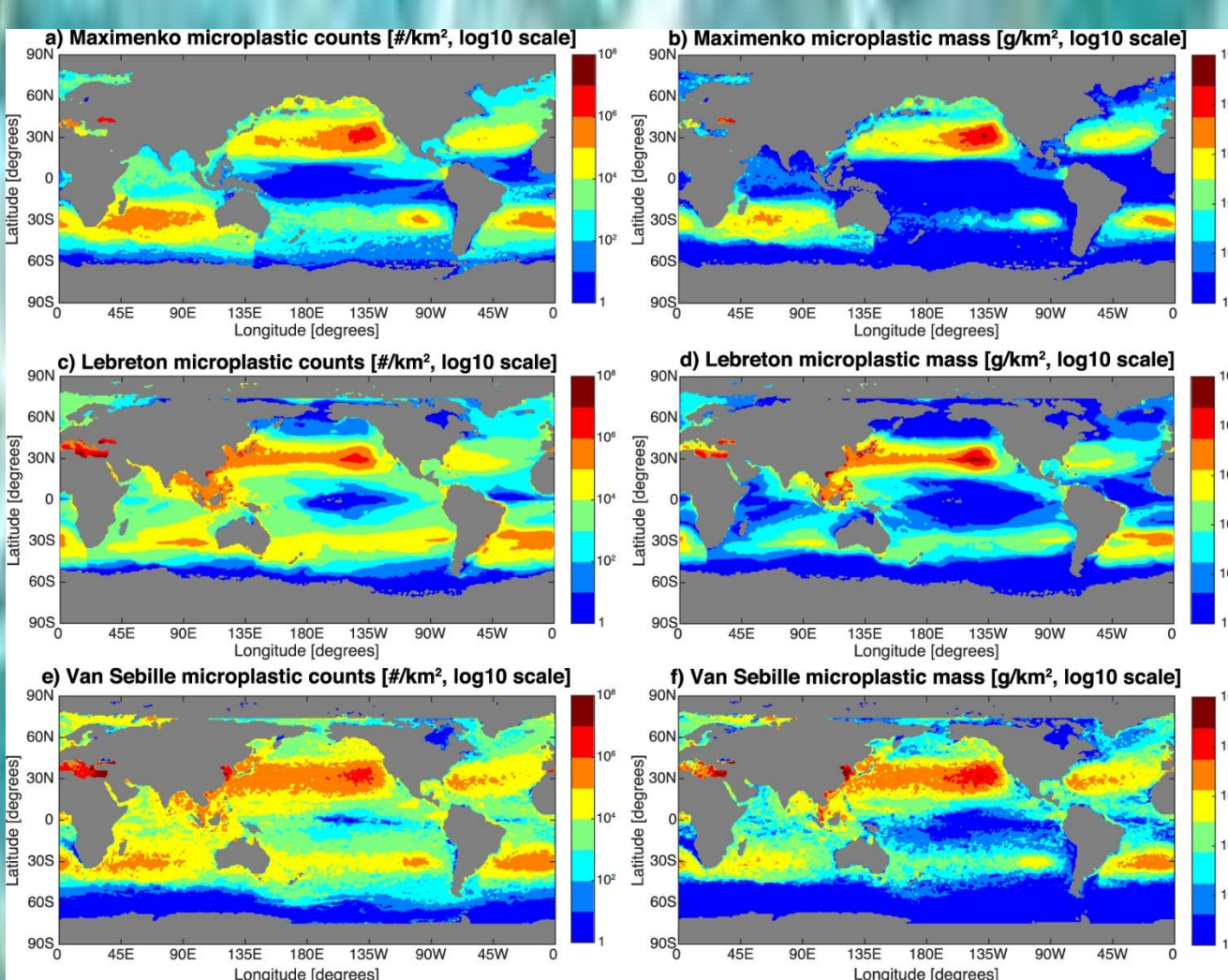


Figure-3 A global inventory of small floating plastic debris (Erik van et al. 2015)

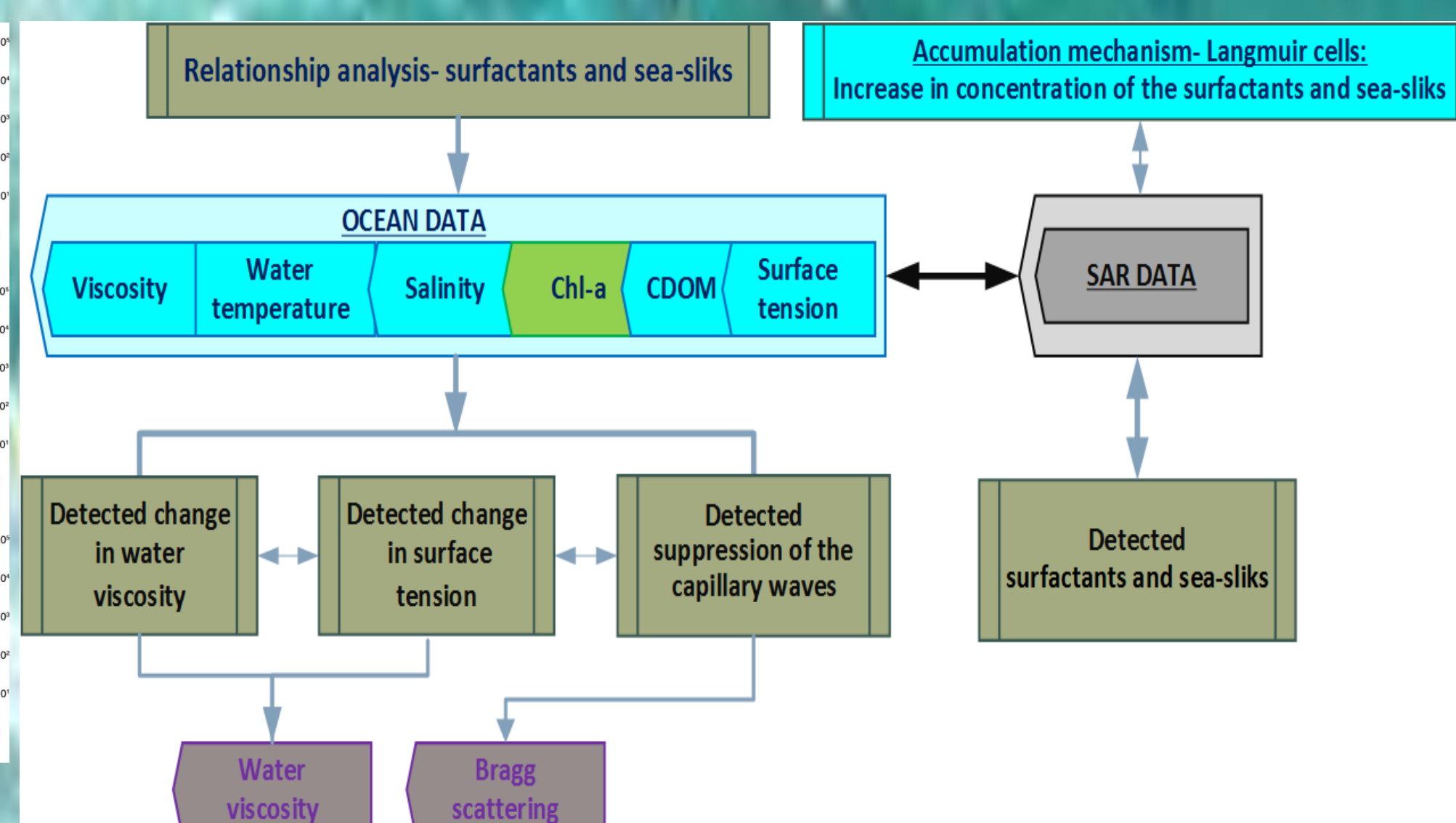


Figure-4 Relationship analysis between surfactants, sea-sliks and ocean mechanisms using ocean and SAR data



Figure-5 Example- Composition of microplastics pollution in the Great Pacific Garbage Patch. Reference: Expédition 7e Continent. Photo Material of the Pacific Garbage Patch Expedition. 2013. The image was recorded on 29 May 2013, at location 30.5N, 132.3W.

PRELIMINARY RESULTS-PRESUMED SURFACTANTS AND SEA-SLIKS

Dataset- c.300 images (5 examples) - North Atlantic- Sentinel-1A Level 1, Extra Wide Swath (EW) Ground Range Detected GRD; Full resolution 25x25m

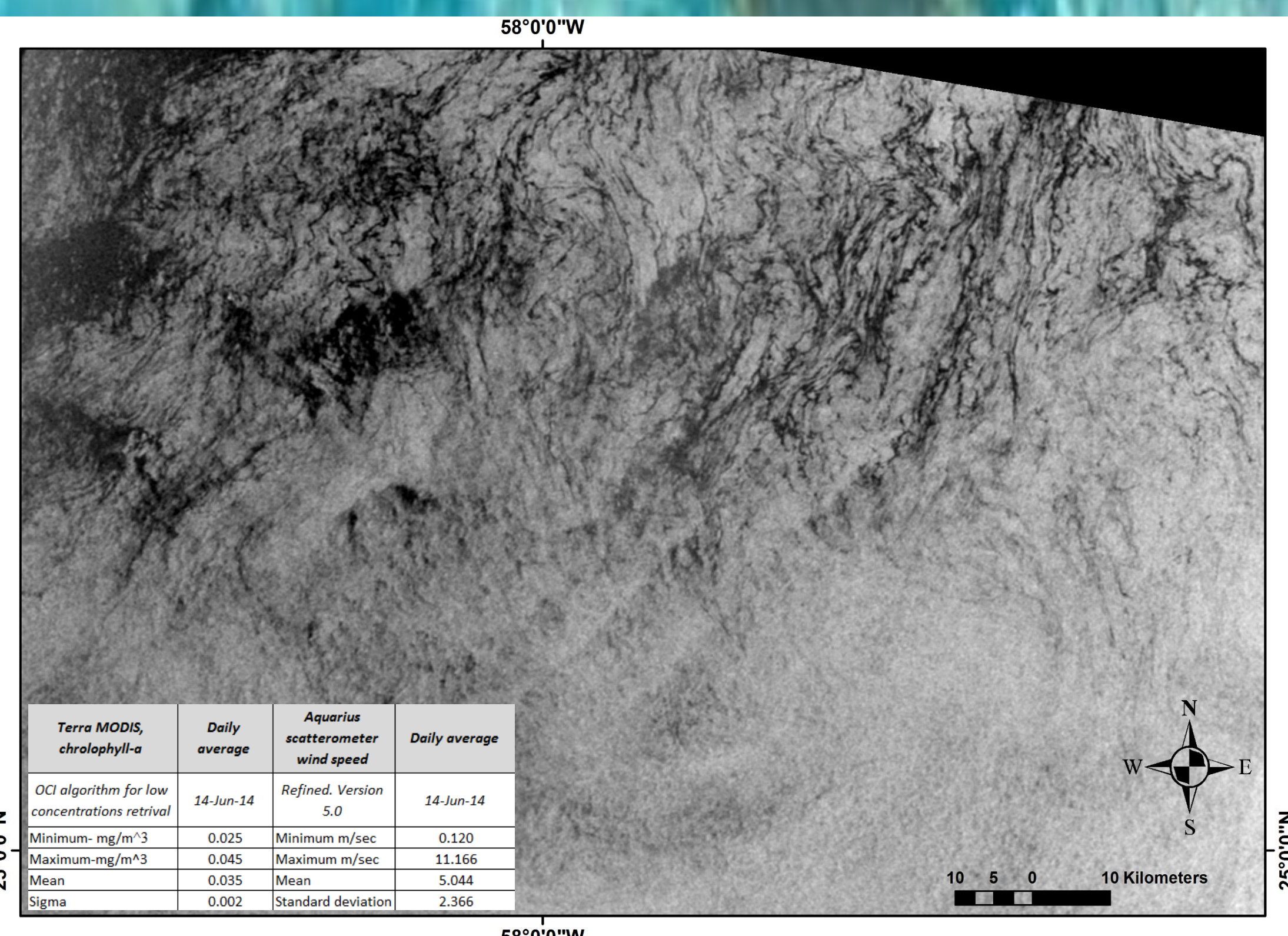


Figure- 5 -Image- Sentinel-1A, EW-GRDH, acquired 14 June 2014, 06:23 am, with corresponding meteorological conditions- daily mean of wind speed and chlorophyll-a

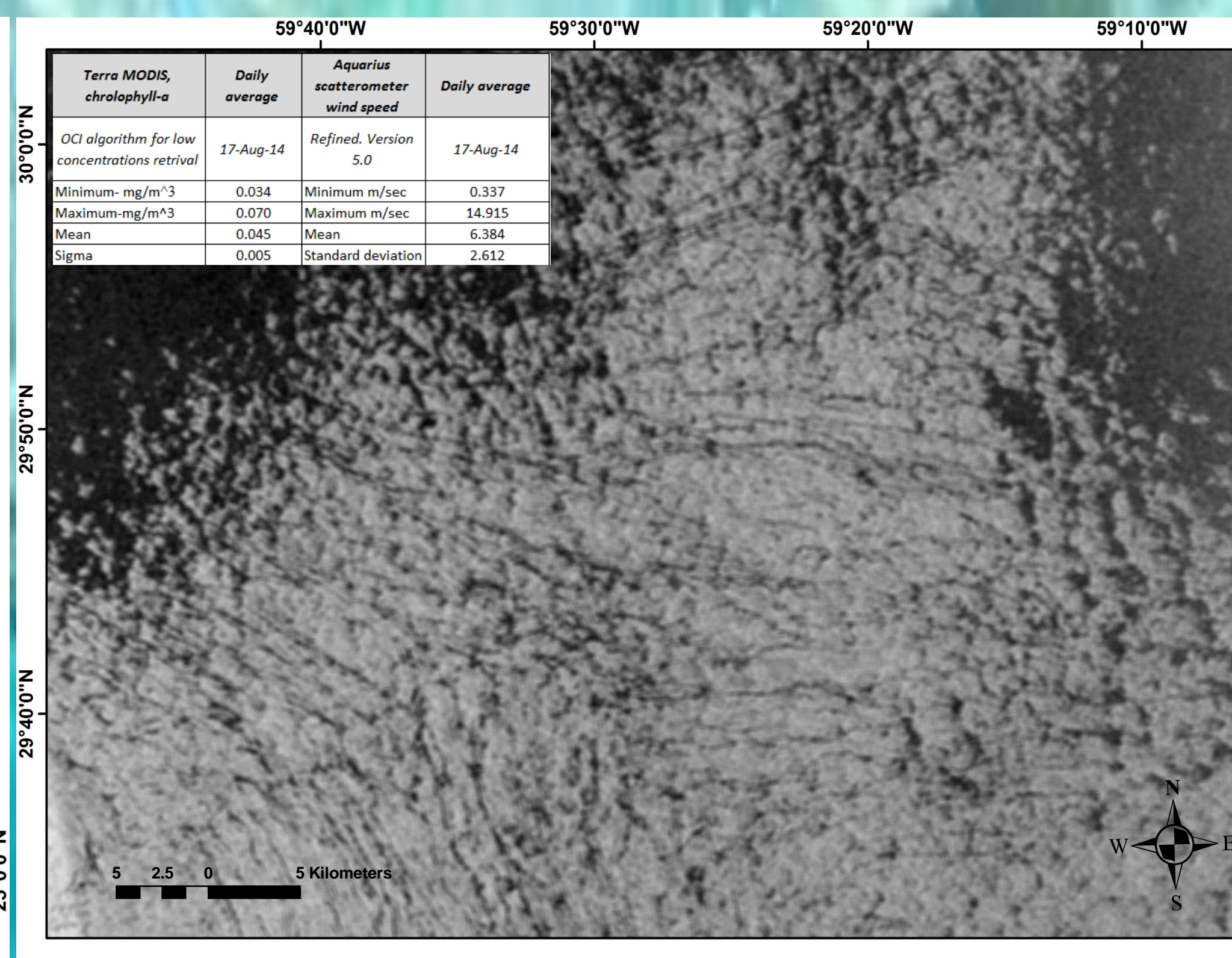


Figure- 6 -Image- Sentinel-1A, EW-GRDH, acquired 17 August 2014, 15:49 pm, with corresponding meteorological conditions- daily mean of wind speed and chlorophyll-a

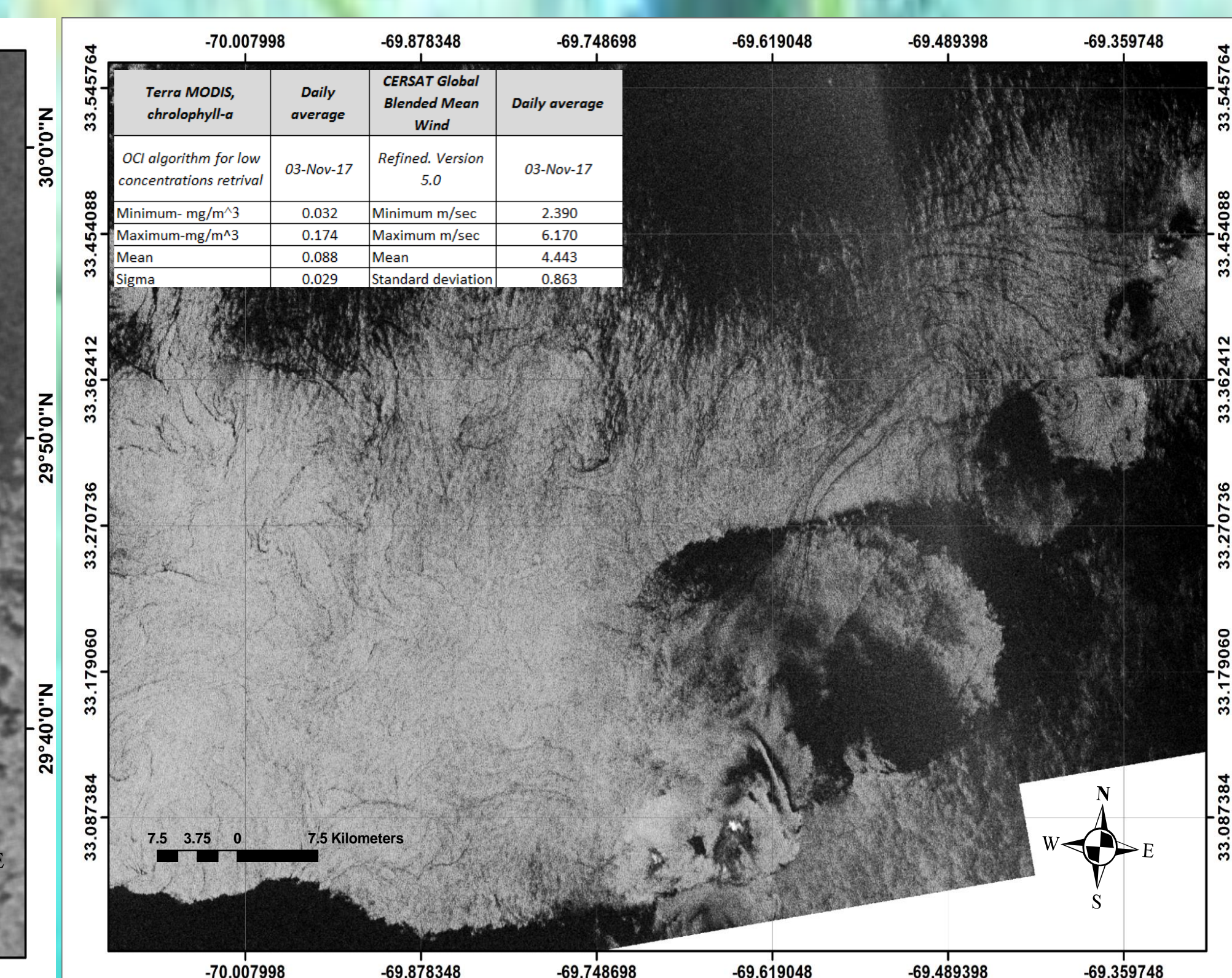


Figure- 7 Sentinel-1A, EW-GRDH, acquired 03 November 2017, 22:40 pm, with corresponding meteorological conditions- daily mean of wind speed, chlorophyll-a

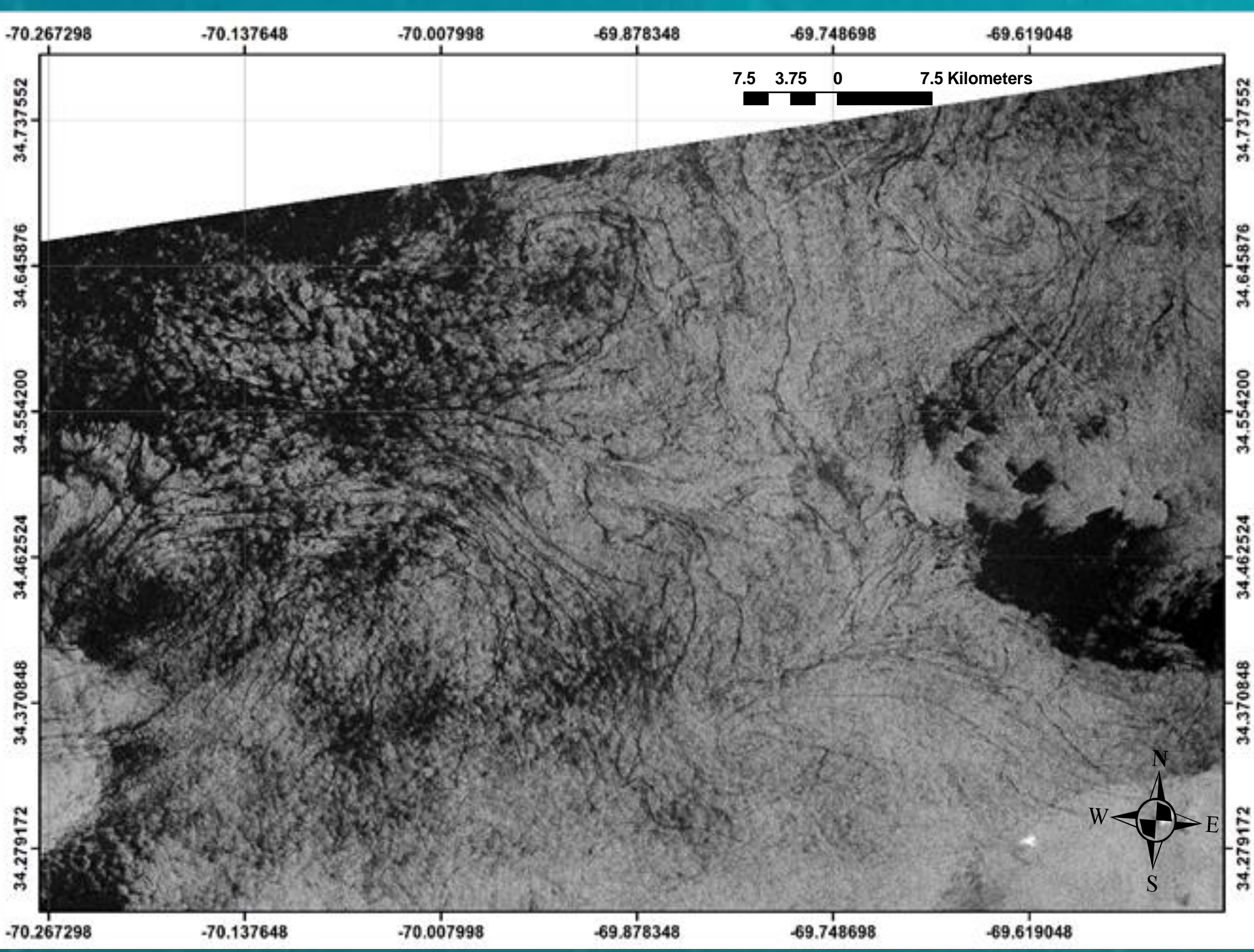


Figure- 8 Sentinel-1A, EW-GRDH, acquired 03 November 2017, 22:40 pm, with corresponding meteorological conditions- daily mean of wind speed, chlorophyll-a

North Pacific- COSMO SkyMed, StripMap HIMAGE, Level 1B (DGM); Full resolution after resampling 4x20m

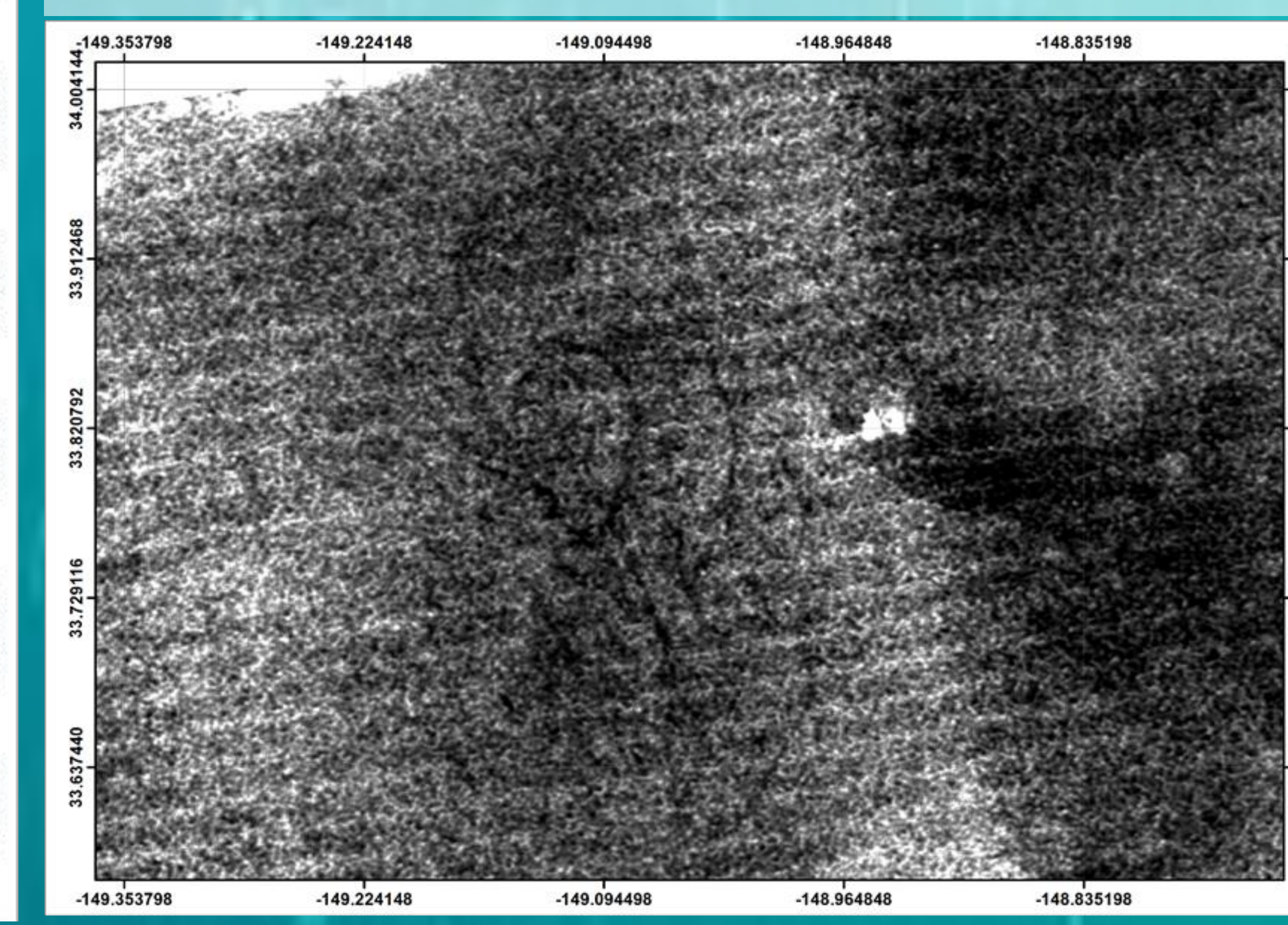


Figure- 9 Image- COSMO SkyMed, Level 1B DGM, acquired 18 June 2013, 15:45pm with corresponding meteorological conditions- daily mean of wind speed and chlorophyll-a

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